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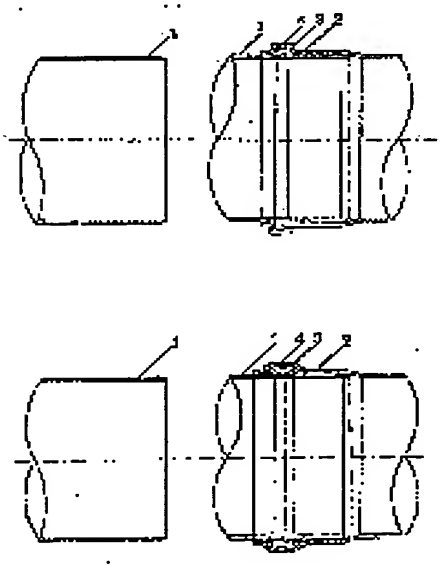
[54] Seal made of elastic material for plug connections in pipes, in particular plastic pipes

A seal made of elastic material for plug connections in pipes, in particular plastic pipes, arranged between the outer side of the spigot of one pipe and the inner side of the socket of the other pipe, whereby a ring (3) made of a firmly adhering permanently elastic jointing compound is located in the annular groove (4) and injection-moulded into an annular groove (4) of the spigot (1) and/or the socket (2). For manufacturing the ring the method utilises a reactive jointing compound based on silicone, polysulfide and polyurethane. Once the cross-linking reaction is substantially completed the pipe and the socket are joined together.



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SEAL MADE OF ELASTIC MATERIAL FOR PLUG CONNECTIONS IN PIPES, IN PARTICULAR PLASTIC PIPES

The invention relates to seals made of elastic material for plug connections in pipes, in particular plastic pipes, arranged between the outer side of the spigot of one pipe and the inner side of the socket of the other pipe.

Plastic pipes based on plastics such as polyvinyl chloride, polyethylene, polypropylene, acrylonitrile/styrol/butadiene mixed polymerisates, polyamides and the like have for many years been joined tight and permanently by means of a plug socket in combination with a rubber ring. This applies to both pressurised and pressureless systems. The pipe spigots and/or socket inner sides are smeared with suitable lubricants (e.g. soft soap) for better insertion. The joining procedure involves simply plugging together both parts with consideration of possible expansion factors.

Over time the weak points of this widespread joining technique are the not quite problematic handling and the defective resistance of the sealing rings to a large number of flow media. Of particular emphasis here is the possibility that the sealing rings are not inserted or are later removed wilfully.

It also often happens that the seal is pressed out when it is joined into the inside of the pipe. In all cases this results in lack of sealing in the pipe system.

The object of this invention is therefore to provide a sealing ring which is permanently elastic, can be removed from the plug sockets only by destroying the ring or the plug connection, has good resistance to flow media and also guarantees a tight connection under pressure.

This task is solved by the seal according to the present invention being made of an elastic material for plug connections in pipes, in particular plastic pipes, arranged between the outer side of the spigot of one pipe and the inner side of the socket of the other pipe, and is distinguished by a ring injection-moulded into an annular groove of the spigot and/or the socket ring and made of a permanently elastic jointing compound firmly adhering in the annular groove. The jointing compounds can be applied in a manner known per se as a 1-component system, that is, cross-linking on air, or as a so-called 2-component system, in which the reactive components are metered and mixed immediately prior to application.

Preferably permanently elastic jointing compounds based on silicone, polysulfide and polyurethane are used.

Of these, silicone compounds occupy a special position with respect to chemical resistance and permanency of elasticity. Silicone compounds also exhibit optimal properties with respect to adhesion and cohesion in combination with primers, e.g. PVC.

Silicone compounds are considered to be those which contain approximately 50 to 70% silicone polymer, approximately 15 to 35% silicone plasticiser, approximately 3 to 7% silicone cross-linker, approximately 7 to 12% silicic acid and approximately 0.005 to 0.02% catalyst.

For example, commercially available aliphatic or aliphatic-aromatic polysiloxanes can be used as silicone polymers. The ratio of e.g. methyl : phenyl groups can be between approximately 25 : 1 and 2 : 1.

In the present case, for the preferred 1-component systems purely aliphatic, polydimethyl siloxanes exhibiting still reactive terminal hydroxyl groups are preferred, which are converted with so-called cross-linkers. These are trialkyl-amino-alkyl silanes, trialkoxy-alkyl silanes or also triacyl-alkyl silanes such as e.g. triacetylmethyl silane. These compounds then react during use through hydrolytic separation, e.g. of acetic acid with formation of intermediate products having cross-linkable silanol end groups, which react immediately into rubber-like macromolecules. The usual catalysts for this reaction are organic stannous compounds such as dibutyl stannous diacetate, dioctyl stannous dimaleinate or stannous octoate.

Dialkyl-arylpoly siloxanes for example known to the expert, which are commercially available products for a wide range of uses, can be used as silicone plasticisers. They fulfil an essential task in maintaining the functionality of the silicone sealing compounds.

With many plastics it is necessary to apply a primer before applying the rubber-elastic compounds. The composition of the primer is adjusted according to the chemical nature of the surfaces to be joined.

These solutions are mostly of reactive isocyanates, silanes or amines in lightly volatile solvents. With respect to the prior art reference is made to Ullmanns Encyclopaedia of Technical Chemistry, vol. 21 (1982), pp. 511-530.

Examples of polysulfide compounds, which are known to the expert (cf. Ullmanns Encyclopaedia of Technical Chemistry, vol. 14 (1977), pp. 261-262) are those made up of 30

to 40% polysulfide polymer, 20 to 30% plasticiser, 30 to 40% fillers, 2 to 4% pigments and 2 to 4 % adjuvants.

Bifunctional silanes and the other adjuvants described in Ullmann (l.c.) are also taken into consideration as primers for polysulfide compounds in this case.

Systems based on prepolymers (polyester or polyether basis) containing hydroxyl groups together with multi-functional isocyanates as well as also still reactive polyester or polyetherurethanes containing isocyanate groups cross-linking in the event of the onset of moisture are taken into consideration as polyurethane-based jointing compounds. In this case also it is effective to utilise both accelerants (n-catalysts) and primers for the polyurethane jointing compounds (cf. Ullmanns Encyclopaedia of Technical Chemistry, vol. 14 (1977), pp. 262 to 263).

Preferably, a jointing compound based on polyurethane is made from the following composition : 25 to 40% prepolymer containing hydroxyl groups together with multi-functional isocyanates or still reactive polyester or polyetherurethanes containing isocyanate groups, 15 to 30% plasticiser, 10 to 50% pigment and/or filler, 0.5 to 1% adhesive agent and/or catalyst or cross-linker.

The seal according to the present invention made of firmly adhering, permanently elastic jointing compound is housed in an annular groove by the jointing compound being injection-moulded from an injection moulder with a template into the annular groove, formed and left to cure. The coating template is adapted to the respective conventional type of plug socket.

During production the jointing compound is injection-moulded from a cartridge or a closed coating system with a template for example into the available annular groove, formed and then left to cure. The result after hardening is the sealing ring according to the present invention.

The sealing rings according to the present invention are permanently elastic, can be removed only by destroying the ring or the plug sockets or the connected pipes, have excellent resistance to media flowing through the pipes and also guarantee a tight join under pressure.

The seals according to the present invention are suitable in particular for plug connections in plastic pipes, but also for plug connections in pipes made of ceramic material or metals.

Due to the seal according to the present invention made of permanently elastic jointing compound handling is improved by less expenditure of effort when pipes are joined together. In addition, safety is clearly increased in any possible shifting, as the sealing rings can be removed only by being destroyed. The solid union of substrate, i.e. pipes, and seal, excludes the sealing rings from being inadvertently shifted.

The invention will be explained hereinafter with reference to the diagrams, in which :

Figure 1 is a side elevation of a pipe spigot and a pipe spigot in a socket according to the present invention.

Figure 2 illustrates a pipe spigot in connection with the socket according to another embodiment of the invention.

Figure 1 shows the spigot 1 of a pipe, the socket 2 of a pipe end, the moulded sealing ring 3 in the annular groove 4 of the socket 2 and this arrangement, when the spigot 1 is inserted into the socket 2.

Figure 2 shows another embodiment of the invention, in which the moulded ring 3 adheres firmly to the spigot 1 and is pressed into the annular groove 4 of the socket 2 when these are joined together.

Claims :

1. A seal made of elastic material for plug connections in pipes, in particular plastic pipes, arranged between the outer side of the spigot of one pipe and the inner side of the socket of the other pipe, characterised by a ring (3) made of a firmly adhering permanently elastic jointing compound in the annular groove (4) and injection-moulded into an annular groove (4) of the spigot (1) and/or the socket (2).

2. A process for producing a seal as claimed in Claim 1, characterised in that the firmly adhering permanently elastic jointing compound is sprayed on as a reactive jointing compound based on silicone, polysulfide and polyurethane and the pipe and the socket are joined together after the cross-linking reaction is substantially complete.

3. The process for producing a seal as claimed in Claims 1 to 2, characterised in that a mixture is used for the permanently elastic silicone jointing compound comprising 50 to 70 % silicone polymer, 15 to 35% silicone plasticiser, 3 to 7% silicone cross-linker, 7 to 12% silicic acid and 0.005 to 0.02% catalyst, preferably 60% silicone polymer, 26% silicone plasticiser, 5% silicone cross-linker, 9% silicic acid and 0.01% catalyst.

4. The process for producing a seal as claimed in Claims 1 to 3, characterised in that a mixture of 30 to 40% polysulfide polymer, 20 to 30% plasticiser, 30 to 40% fillers, 2 to 4% pigments and 2 to 4% adjuvants is used for the polysulfide jointing compound.

5. The process for producing a seal as claimed in Claims 1 to 4, characterised in that the polyurethane jointing compound uses a mixture of 25 to 40% reactive prepolymer containing isocyanate groups, 15 to 30% plasticiser, 10 to 50% pigments and/or fillers, 0.5 to 1% adhesive agent and/or catalyst or cross-linker.

6. A process for applying the seal as claimed in Claim 1 in an annular groove, characterised in that the jointing compound is injected from an injector with a template into the annular groove, formed and left to cure.